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THE ERIE CANAL AND TRANSPORTATION.

BY EDWARD P. NORTH, MEMBER OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

TRANSPORTATION in its great service to mankind, and as administered in this country, may be regarded as the most successful of all applications of labor-saving machinery, one which eliminates as far as possible the disadvantages of position, and so reduces the cost of exchanging property as to give the largest reward to the producer and the maximum product to the consumer, with the result that both, having greater net gains, can increase the capital necessary for further labor-saving machinery.

The most beneficent labor-saving appliances and the greatest contributors to increased capital and the improved condition of mankind, since the power of steam has been employed in production, have been the canal and railway developments in England and, later, the relatively free railroad building, with the improvement of toll-free waterways, in this country.

Unfortunately, a full conviction of the great truths of classical political economy carries with it a necessity of obscuring the fact that the entire cost of transportation must be distributed in some ratio between the producer and consumer. This fact could not be enunciated as among those immediately and intuitively known by the best minds, or the plan for enriching the world by transporting its raw produce to one locality for manufacture and bringing the finished product back would be seen to have less potentiality of wealth than a perpetual motion machine.

Under the necessities of science, the mediæval theory that transportation was only valuable for the tolls that could be exacted has not received the disapprobation from our best thought that it merits; and great statesmen and publicists are still more profoundly impressed by the wealth of Tadmor than by the industrial history of Holland in the seventeenth century, of England in the first half, and of the United States and Germany in the last half of this century.

In spite of well-established theories, it is now seen that the advantages of transportation, either to the public at large or to particular localities, do not lie in the amount of tolls that can be pinched from passing merchandise, but in the fact that the relative cheapness of assembling the raw materials for manufacture and distributing the finished products determines the position of great industries, wealth and world power, though wealth leaves a country more slowly than its industries. Cheap transportation also presents the additional advantage that it encourages the production of bulky and low valued goods which would be prohibited by high freight rates.

The power of Holland, which enabled her to drain Philip's gold and divert the carrying trade of Portugal, was based on the cheap transportation afforded by the mouths of the Rhine and Maas. Thiers said that it took only fifty years, Louis XIV. and Cromwell's Navigation Act, to debase this power. At the commencement of this century, England was better served per square mile by canals than this country was by railroads in 1850; and, up to about 1870, she had the cheapest internal transportation of any country. At that time, the great industrial powers were England, France and the United States, and few thought it possible she could lose her supremacy. But England has not materially reduced freight rates since she adopted free trade. It is said to cost more per mile to get a charter through Parliament than to build a mile of prairie railroad. Every canal, navigable water course and harbor is in the hands of a corporation or trust, and tolls are charged. Her manufacturers now pay a higher rate for assembling their raw materials than the manufacturers of any other country; and, according to Lionel B. Wells, only 18.5 per cent. of her freight is foreign. In 1870 our freight rates were falling below England's, and we took the first place as the world's servant. Now England is fighting with Germany, which is enlarging its waterways, to retain the second place, with a fight with Russia for the third place in sight; for the power of invested capital in England is too strong to allow her to build either larger and toll-free canals or competing railways.*

It was, doubtless, a full mental adhesion to the older com-

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* **Mulhall gives the following as the average freight rates in cents in the countries mentioned; viz:**

United States	0.8	**Holland**	1.56	**Belgium**	1.60
Germany	1.64	**France**	2.20	**Russia**	2.40
Italy	2.50	**United Kingdom**			2.80

mercial theory that inspired two substantially identical replies to the circular letter of the Committee on Canals of New York State, asking the probable effect of a ship canal on the commerce of New York: one from a moulder of the youthful mind in a neighboring institution of higher education, the other from a purveyor of convictions to those of more mature age, viz.: "A ship canal would put an end to the transshipment of goods at New York and lessen, rather than increase, the commerce of the metropolis. . . . I should suppose the interests of the State would be injured rather than benefited by a ship canal;" and, "It would seem that such a canal could not be expected to be of any special advantage to the port of New York, since vessels going through it could readily pass on through that port to their further destination." It should be noted that the ship canal proposed would carry 24,000,000 tons, while the present canal contributes some 3,000,000 tons to our commerce.

The canals of New York have been of great service to the City and the State of New York and to the country. When the Erie Canal was opened for through traffic, in 1825, boats of sixty tons superseded wagons of one to one and a quarter tons. The cost of freight between Buffalo and Albany fell from $100 to $10 per ton. The consequent increase in traffic and wealth justified an enlargement, commenced in 1836, whereby boats of 240 tons burden replaced those of 60 tons, and canal freights fell to three dollars per ton; it also developed the commercial confidence necessary for the construction of the New York Central line and the Erie Railroad.

Transportation by the canals of the State was so relatively cheap that the State was able to collect tolls aggregating nearly $135,000,000 on the merchandise transported, or about 1.5 per cent. on its value. In addition to direct income, which more than returned the cost of the canals, they developed along their banks manufacturing centres and the richest and most intelligent rural population in the world, encouraged emigration and brought the produce of the West to the docks of New York, making that city, with the aid of its natural advantages, the largest exporting and importing port of the country. And they so concentrated the main lines of railroads on the Bay of New York that it has become the cheapest point in the world for assembling the raw materials for manufacture and distributing the finished products. There is no other place that has equalled it, either in the value of goods produced or in wages paid.

Although boats of more than 240 tons capacity cannot yet pass through the Erie Canal, it carried nearly its maximum tonnage until about 1880. Up to 1850 or 1855, the maximum through train load on the New York Central was 200 tons, or less than a canal boat load. Now trains carrying over 2,000 tons, or more than eight boat loads, do not call for newspaper notice, and no one can safely say that train loads of 3,000 tons are not probable. Until 1880 the canal was the great director of heavy freight traffic; express freight and passengers followed its line. At the last mentioned date, freight-train loads began to approximate 1,000 tons, and the decline in the value of the canal as a freight carrier was rapid. Canal freights have shrunk to about half of what they then were. The Erie Canal cannot be called an efficient director of freights at present. It teases rather than controls railroad freights, and any quotation of statements made by the late Albert Fink as to the influence of the canal on freight rates, however pertinent to the conditions of 1880, are now misleading; they do, however, apply to the opening of lake traffic.

In 1865, Dean Richmond, then President of the New York Central Railroad, refused to co-operate in a raid on the canal, saying that he would rather help to make it two feet deeper, since it was an aid to the railroad. Now an authority not prominently connected with railroads advises that the Erie Canal should be closed. An expenditure for repairs and lock tending of nearly six and a half million dollars, or 21.74 cents per ton moved, during the seven years ending with 1896—an expenditure under which the canals so deteriorated that they were likely to become closed in ten years—may justify the advice, unless the Erie Canal can be restored to public service, by so increasing its capacity that boats carrying at least twice as much as any probable railroad train, can navigate it with speed and convenience.

It is desirable, not only for the city and State of New York, but for all countries consuming either raw or manufactured products, that we should have through the present centres of population, production and consumption in New York a channel of distribution so ample and convenient that, as far as sound judgment can foresee, the minimum freight rates shall be charged and, generally, the resistance to transportation shall be less on it than on any other conceivable route between the Great Lakes and the Atlantic.

This can be done only by a canal of such cross section as to pass readily the largest boats navigating or likely to navigate the lakes. It would give every farmer in the West two or three cents more for his grain and increase his purchases from New York city. It would restore the central part of the State to the relative prosperity of fifty years ago, triple if not quadruple the traffic of the port of New York, and perpetuate its supremacy as a manufacturing and commercial centre.

Elevator interests oppose to such a contribution to the wealth of the country, a scheme analogous to what the people of Buffalo and New York, forty-five years ago, were denouncing as the Erie "pie shop" policy, because that Pennsylvania town insisted on a break of gauge that it might realize transfer profits.

The decline in the service rendered by water courses of small or shallow cross-section is not peculiar to the State of New York. Both in this country and in Europe, small water courses are being abandoned or disused; but any reference to this fact not including the relation between the capacity of the boats usable on such waterways and that of competing railroad trains evinces either ignorance of the governing factor in the case or carelessness in statement. Von Regierungs und Baurath Sympher shows the influence of large and small waterways on traffic in a late paper on the increase of traffic on German waterways. During the twenty years ending with 1895, the traffic on the smaller waterways has increased by 36 per cent.; on the seven large ones by 236 per cent. In the same time the traffic on the French waterways has increased by 92 per cent. The larger German waterways carry boats of about 800 tons, and the French interior navigation is limited, except on the Seine and Rhone, to boats of 300 tons. The largest German traffic is on the Rhine between Kehl and the frontier of Holland. The improvement of the Main between Frankfort and Mainz is of interest, both because it is an example of sound German engineering and it has added materially to the traffic of the Rhine. The low water depth of the Main was two and a half feet, and its traffic was decreasing until 1883, when its depth was increased to seven and a quarter feet, although the governing depth of the Rhine below its mouth was only six feet. The result has been an increase in the annual tonnage from about 150,000 to 1,500,000 tons. Concurrently the railroad freight of Frankfort has almost doubled.

Deepening the St. Lawrence below Montreal from eleven to twenty-seven and a half feet, combined with present operations to secure thirty-five feet, has resulted in increasing the tonnage of the port by 750 per cent. since 1853.

Our St. Mary's Falls Canal, generally called the "Soo," connecting Lake Superior with the Lower Lakes, has added greatly to the comfort and convenience of mankind. It was opened in 1855 under a State charter, having two lift docks, with eleven and a half feet on their mitre sills; tolls were charged at an average rate of four cents per registered ton until 1880, when its traffic was 1,734,890 tons. In 1881, a single lift lock with seventeen feet in its mitre sills was opened by the general Government, and the canal was free from tolls. Three years later, when 2,997,837 tons passed, 89 per cent. of the traffic was carried in vessels of too great draft for the old locks.

In 1890 the tonnage through this canal exceeded that through the Suez, which carries the traffic between the Pacific coasts of Asia and Africa on the one hand, and Europe and the Atlantic coast on the other. Since 1895 the tonnage passing the Soo has been more than double that through the Suez Canal.

In 1895 the Canadian lock, with twenty feet, and in 1896 another American lock, with twenty-one feet on its mitre sills, were opened. This is called the Poe lock, after the late General O. M. Poe, who, in spite of the protests of those owning what with larger channels would become small boats, successfully advocated the larger lock, and the twenty-foot channel through the lakes. From 1855 to the present time the lake channels have been deepened from nine and a half to twenty feet.

For the last twelve years the Government engineers in charge of the canal have, with the kindly co-operation of the Canadian authorities, kept statistics of the tonnage, value, distance transported, and cost of transportation, of the freight carried past the Soo. The figures for the twelve years are: 144,077,891 tons, valued at $1,705,009,823, carried an average distance of 827 miles, at a cost of $133,838,729, or an average rate of 1.123 mills per ton mile. The average value of the freight, which has varied by years from $13.83 to $10.59, was $11.14, and the lake carriers received 7.85 per cent. of this value for transportation. The yearly rates have varied from 2.3 mills per ton mile in 1887 to .79 of a mill for 1898. As the Canadian lock was not opened until September 9, 1895, it will be satisfactory to state that the average of the rates for the nine years ending with 1895 was 1.89 mills, as against .87 of a mill for the three succeeding years.

During the time under consideration, railroad freights have been higher than lake freights, and have not fallen so fast; and the cost of an equal amount of ton-mileage at railroad rates would have been over one thousand million dollars, or 60.32 per cent. of the value of the goods transported; a percentage which would have prevented the production of three-quarters of the freight marketed. The difference between the two sums, $894,596,789, is not the full measure of the beneficence bestowed on the people of this country by that improved waterway. It is to be measured by the value of this freightage when prepared for consumption, which would much more than double the last figures.

For the three years since the deeper locks have been in use, the average assumed difference between lake and railroad costs has been $117,115,262, which is equivalent to an annual dividend of 36.5 per cent. on the total appropriations by the Government for all improvements of rivers and harbors. It has been objected to such benefits as accrue from public improvements of our waterways, that they cause us to look on the Government as a giver of gifts, but it will immediately appear that a Government which has no higher aspirations than to conserve the sordid holdings of those too selfish to put their capital into productive enterprises, has no excuse for existence.

In this place it may be said of the Nicaragua Canal, that no one, even to convince himself, can seriously argue that the traffic between the Atlantic and Gulf coasts of this country and its ports on the Pacific can be measured by that out of Lake Superior, or even by the forty million tons of freight that passed Detroit in 1898, or that the saving per unit of freight would be less. The Nicaragua Canal, as giving us the shortest practicable water route, should be built by the United States and maintained free from toll.* The great traffic through that canal will be a coasting traffic and under our flag, as is 98 per cent. of that through

* For the three years ending with 1897 the tolls collected on the Suez Canal have averaged $1.82 per net registered ton passing. The yearly average is nearly $16,000,000

the Soo. And where Americans conduct the traffic, the service will be performed at the minimum cost. The wisdom of depriving American interests of three or four hundred million dollars a year for an indefinite period on the plea that ten per cent. on half of this sum may possibly be saved in the original outlay is at least questionable.

As our parasitic class thinks it does a service to the capital invested in railroads by denouncing river and harbor bills, an effort has been made to discover the effect of the low lake-freight rates on both the tributary roads and those which at the same time are fed by them and compete with them. The result is as shown in the accompanying table. Too much labor was involved in an effort to trace the capital, net earnings, etc., of the roads northwest of Chicago, so only the mileage is given, and its relation to the total mileage in the country. For the trunk lines it has been possible to present the necessary figures since 1870. As Mr. John P. Meany, the editor of "Poor's Manual," has been kind enough to either check or furnish the figures employed, the table may be accepted as free from errors, due either to ignorance or an excessive trust in a theory.

	Net registered tonnage through the Soo.	Miles of railroad in Michigan, Wisconsin and Minnesota.	Percentage of total.	Miles in Dakota, Montana and Idaho.	Percentage of total.	Stocks and bonds of N. Y. C. & H. R., L. S. & M. S., M. C., Erie, Penn., & P., Ft. W. & C. R. Rds.	Per cent. of net earnings.	Ton mileage. 1 = 1,000,000	Freight earnings.	Average ton mile rate. Cents.
1855	106,296	757	3.5	......	....	....		....	....	...
1870	690,826	4,235	7.9	......		$436,523,095	6 93	3,798.2	$60,542,437	1.59
1881	2,092.757	11,117	10.6	2,136	2.0	663.687,725	7.36	12,199.3	93.958,750	0.78
1898	18,622,754	20,733	11.1	9,617	5.2	1,054,922.566	5.22	23,777.9	128,911,069	0 54

It will be seen that neither in Michigan nor in any State west of it has the water traffic injured railroad building. Nor has the healthy development of capital by the trunk lines been arrested. The ton mile rate has fallen, so that one dollar which in 1870 would transport a ton 62.9 miles would carry it 128.2 miles in 1881, and 185.2 miles in 1898. In other words, about 66 cents out of each dollar expended for freight in 1870 remains to be divided between producer and consumer in 1898, or the length of haul may be three times as long.

These rates have been forced down partly by the competition of the water route, and partly by the larger volume of freight offered through the increased wealth and production due to the lower rates. But it would be as fallacious to say that the freight earnings for 1898 would have been four hundred and sixty-seven, instead of one hundred and twenty-nine, million dollars if the rate of 1870 had been maintained, as to claim that, if our railroads had collected the rates current in England, they would have earned over three thousand million, instead of less than nine hundred million dollars, as they did. Notwithstanding its great wealth, the country is not rich enough to pay the British rate for transportation. It cannot, however, be disputed that, during the twenty-nine years mentioned, the interest on capital invested in railroads has fallen, and though the study is not as exhaustive as desirable, it shows that the fall has not been as great as in other businesses, and it will probably be thought sufficient to clear the river and harbor bills from any more serious charge in the interest of capital invested in railroads than causing some trouble to railroad managers. This is different from the generally received view, but that is based on a failure to notice that bankrupt roads generally do not have their traffic developed by ample waterways.

Inadequate water courses are now losing traffic or being abandoned. Ship canals are being built and planned, and in this country, Germany, Russia and France the cross-sections of navigable ways are increased, that wealth may be augmented by cheaper transportation. And though no other traffic route concentrates as great a trade as that of Detroit River, namely, 40,000,000 tons—two-thirds of which, it is estimated, is raw material on its way to an increase of value through the expenditure of further labor—a large party in the State of New York insists, with a former Superintendent of Public Works, that: "It is clearly evident that the duty of the Legislature will be to provide the means for the construction of the largest possible canal, intended for the navigation of boats of such construction as will be able to navigate the inland waters of this State, discharging and receiving their cargoes at Buffalo and New York, or the other intermediate points."

This has been the practice for seventy-three years. Two transfers, one at Buffalo and the other at New York, have been maintained. In a report made in 1896 by a board of Government engineers, it is stated that "the cost of once unloading and reloading a cargo of coal would carry it, at the rates of 1894, 291 miles on the Erie Canal, or 946 miles on the lakes." This is about equal to the distance between Chicago and Buffalo for the lakes, and would land eastbound freight half way between Little Falls and Schenectady for the canals. Of course, such transfer charges prohibit the vast volume of freight passing Detroit entering this State for manufacture. In the meantime, the farming lands in the centre of the State are being depopulated through the lack of local markets, and in the twenty years ending with 1890 the population of Rochester, Syracuse, Rome and Utica, cities on a waterway of small cross-section, increased by only 93.5 per cent., while that of Buffalo, Cleveland, Detroit and Chicago, cities on a waterway of large cross-sections, increased by 209 per cent. And the heads of Seneca and Cayuga lakes, which are as near to one-half of the coal produced in Pennsylvania as Erie, and as near to 60 per cent. of this coal as Cleveland, could be made great manufacturing and shipping points in the service of Lake Ontario and St. Lawrence ports, as well as of this country, but are now undisturbed by prosperity.

The provision that boats shall receive and discharge their cargoes at Buffalo and New York shuts all but three out of the forty million tons passing Detroit from access to New York by water carriage; it decreases the value of all raw material produced west of Buffalo, without increasing the value of that produced east of that point; it increases the cost of finished products to all who are reached by our commerce; it impedes the investment of capital and employment of labor in the State, thereby diminishing its resources, and it does not help the railroads. The continued maintenance of two toll gates in this State, that the few may receive large gains from handling the minimum amount of merchandise, to the loss of the many, is a commercial outrage, and we have to go back to the revenue reforms of the Rhine barons for an analogue.

Public attention has never been effectively called to the relations between manufacturing and commerce at the port of New York. The following figures are given to the nearest million dollars. The census of 1890 shows that the value of manufactured products in the old City of New York was $777. In Greater New York, with Jersey City, Hoboken and Newark, it was $1,201, and the wages paid in manufacturing in the above cities was $335. For the fiscal year 1890, the foreign commerce of this country was $1,647; exports, $858; imports, $789. For the port of New York, exports were $348, imports $516; total, $864. It will be seen that the value of manufactures produced on what may be called the Bay of New York was about three-quarters of that of the total foreign commerce of the country, and the wages paid nearly equalled the value of exports from the port.

This spring the Hon. Joseph Nimmo, Jr., estimated the value of manufactured products in the old City of New York at $1,000, and if this estimate is correct and industry has increased proportionately over the whole area, the value of manufactured products must be for this year $1,546, and the payment of wages $431, or decidedly greater than the value of imports received at this port in 1898. If, as economists say, commodities exchange for commodities, the factories on the Bay of New York are worth more to the farmers of this country than the markets of the whole world outside of the United States.

The relation between the factories in the area mentioned and the commerce of the port or the country is not so easily obtained, but a valuable approximation can be reached. The total foreign trade of the United States for the fiscal year of 1898, the figures representing the nearest million as before, was $1,847, viz.: Imports $616, domestic exports $1,210, foreign exports $21. Of the exports of domestic merchandise $921, or 24.1 per cent., were classed as manufactures. The foreign commerce of this port was $848, viz.: Imports $402, domestic exports $437, foreign exports $8. Neither the exports nor imports are classified by ports, but through the kindness of Collector Bidwell and the statistical staff at the Custom House, it may be said that the value of articles in classes "B" and "C," viz., "articles in crude condition, which enter into the various processes of domestic industry," and "articles wholly or partially manufactured for use as materials in the manufactures and mechanics arts," imported in 1898, was $149, or 37 per cent. of the port's imports. If the $28 worth of various cloths, which generally have a further increase of value given them before use, is added, we will have 44 per cent. as the proportion of the port's imports dependent on manufactures.

The value of articles of domestic make exported from this port in 1898, which appear to be fairly included in classes "B" and "C," was $155, or 35.5 per cent. of total domestic exports. The value of all breadstuffs, $100, or 22.8 per cent., and the value of grain $74, or 17 per cent. of the exports. Thus it seems that approximately, $333, or 39.6 per cent., of the foreign trade of the port of New York was directly contributed by local and tributary manufacturing industries.

Efforts to maintain the present stricture between the 40,000,000 tons of freight passing Detroit and the probable 70,000,000 tons of shipping, domestic and foreign, in the harbor of New York, as well as efforts to have any improvement limited to such size as will require a continuance of transfers, are not only inimical to the interests of the State, which could and should manufacture as much per mile front of a competent canal as is manufactured on an equal frontage on the Sound in Connecticut and Rhode Island, but are inimical to the largest and most productive interests of the city and its neighborhood. The influence of allied capital, which is making money, over public and legislative opinion is illustrated by the fact that although State Engineer Sweet read a widely discussed paper before the American Society of Civil Engineers in 1884, advocating a radical enlargement of the Erie Canal, the State has not yet appropriated one cent to establish the probable cost of such an addition to its wealth.

Lately a Deep Waterways Commission has been appointed to report on routes between the Great Lakes and the Atlantic. As the Venetians joined the Turks in the sixteenth century to oppose the exhibition of Portuguese Christianity in the Orient, that their profits on an expensive trade route might be retained, some power has joined the Canadians in enacting that the people of the United States shall pay for surveys and a report that, as far as it is effective, cuts out from the advantage of an improved waterway the two hundred and fifteen miles between Tonawanda and Rome, the Commission not feeling at liberty to ride over this portion of the canal in a steam launch offered by the State Engineer, and offers the commerce that sweeps by Detroit the advantages of an easy descent to Montreal, or the necessity of locking up one hundred and sixty feet from Lake Ontario to Rome. Instead of a canal fed from Lake Erie, descending continuously to the Hudson and discharging a copious supply of water into that stream, it is proposed to construct an aqueduct to feed the Rome level. The realization of this scheme would require the rearrangement and reconstruction of all trunk lines south of the St. Lawrence. The Senators and Representatives of the State of New York seem to be holding the garments of those engaged in the transaction.

Considering the growing tendency on the part of State Railroad Commissioners to restrict competitive railroad building, it is quite possible that the City of New York may find a differential on package freight, as well as on grain, enforced against its commerce with no possibility of redress, or effective threat of retaliation by building a competing road.

Some assertions made by advocates of the present state of canal transportation may be noticed:

I. "The cost will be prohibitive." The most obstructive estimate of cost known is $250,000,000. This is five and three-quarter cents out of every dollar of assessed value in the State. A forty-year bond at 3 or even 3½ per cent. on this proportion of our wealth should not permanently enfeeble the State.

II. "Traffic can be conducted at less cost in a small or shallow canal than in one of greater size." Acceptance of this thesis requires that one should believe that the smaller the channel the less is the friction. Nor is it true that small boats in a tow are as objectionable as weak cars in a freight train. Small and large boats are towed together without injury on all streams of large traffic.

III. "Steamers cannot be successfully used both on the ocean and lakes." The assertion is ventured that it would be impossible to find a steamship builder in the world who would stand up before three of his fellows and say that he could not build a successful boat for service in both shallow and deep, in fresh and salt water.

EDWARD P. NORTH.